

# BATS FROM THAILAND AND CAMBODIA

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# BATS FROM THAILAND AND CAMBODIA

By J. E. HILL & KITTI THONGLONGYA

## INTRODUCTION

THE chiropteran fauna of southeast Asia as a whole is as yet not fully understood and knowledge of the bats of Thailand and Cambodia in particular rests largely on the efforts of a limited number of collectors. In recent years a more active interest in the bats of the region has become apparent and as a result a number of specimens have been received for determination at the British Museum (Natural History). Some of these have led towards the solution of taxonomic problems of long standing; others represent new records or range extensions for Thailand and Cambodia or are examples of taxa rare in collections. The majority of the specimens originate from Thailand and have been obtained over several years by Dr. J. T. Marshall of the United States Army Medical Component, South East Asia Treaty Organization. These were examined initially in Thailand by the junior author and are now in the collection of the British Museum (Natural History), except for a number of duplicate specimens sent to the Smithsonian Institution, Washington. A few specimens collected by the junior author are from the Thai National Reference Collection of which he is Curator. Cambodian specimens obtained by Mr. J. M. Klein are from the Museum National d'Histoire Naturelle, Paris, a small series of duplicates being retained in the British Museum (Natural History). Measurements are in millimetres: the minimum, maximum and mean (in parentheses) are given for series.

## ACCOUNT OF SPECIES

### *Rousettus amplexicaudatus amplexicaudatus* (E. Geoffroy, 1810)

THAILAND: Doi Pha Hom Pok, Fang, Chiangmai, 6,800 feet, c.18° 47' N., 98° 59' E. 1 ♂ (young).

Phu Nam Tok Tap Kwang, Kaeng Khoi, Sara Buri, c. 14° 42' N., 100° 52' E. 2 ♂♂ (1 young).

The specimen from Doi Pha Hom Pok confirms the record by Chasen (1940 : 29) of *R. a. amplexicaudatus* from the mountains of northern Thailand, a region apparently on the northwestern border of its distribution.

### *Rousettus leschenaulti leschenaulti* (Desmarest, 1820)

THAILAND: Koh Klet, Pak Klet, Nonburi, 13° 50' N., 100° 29' E. 1 ♂.

Bang Phra, Siracha, Chonburi, 13° 12' N., 100° 57' E. 8 ♂♂ (6 young), 6 ♀♀ (young).

Recorded hitherto from the mountainous northern part of Thailand by Chasen (1940: 29). Specimens (B.M. 14.12.8.31-34) reported from Tagoot, Tenasserim, Burma as *R. leschenaulti* by Wroughton (1915: 702) are in fact *R. amplexicaudatus*.

*Pteropus hypomelanus* Temminck, 1853

THAILAND: Tao Poon, Koh Som, Koh Samui, Surat Thani. 1 ♂ (young), 2 ♀♀ (1 young).

The small islet of Koh Som is close by the larger island of Samui, in the Bight of Bandon off the east coast of southern Thailand. No collector of mammals appears to have visited it hitherto although Koh Samui was visited by H. C. Robinson and C. B. Kloss in 1913 on behalf of the Federated Malay States Museum. No *Pteropus* were encountered (Robinson and Kloss, 1915a) and the genus was first reported from the islands by Marshall and Vandee (1970 : 504) who recorded these and other specimens obtained in 1968. *Pteropus hypomelanus* is known to occur on a number of the other small islands off the east coast of the Malay Peninsula and on the Natuna Islands.

The back of the adult female from Koh Som is black, streaked with grey, the mantle bright chestnut and the head greyish, tinged with buff. The underparts are predominantly grey brown or hair brown, excepting for a band of black across the base of the throat. The young male and female have less grey on the back, the mantle bright chestnut in the male and deep rufous in the female, both with blackish brown crown and nape and with black underparts. Measurements of the adult female: length of forearm 141; greatest length of skull 64.3; condylobasal length 62.3; palatal length 36.9; least interorbital width 8.4; postorbital width 7.6; zygomatic width 31.6; braincase width 21.6; mastoid width 19.9;  $c^1-c^1$  11.0;  $m^1-m^1$  17.6;  $c-m^2$  24.3; length of mandible 48.9;  $c-m_3$  27.4.

It is difficult to refer these specimens to any of the subspecies of *P. hypomelanus* so far described from the islands of the South China Sea. The darker back and greyish or black brown crown and nape set them apart from the pale subspecies *P.h. lepidus* from the majority of the east coast islands of the Malay Peninsula and *P.h. canus* and *P.h. annectens* from the North and South Natuna Islands; although the colour of the back resembles that of *P.h. condorensis* from Con Son Island (Pulo Condore), in this subspecies the crown and nape are chestnut brown like the mantle. Andersen (in Kloss, 1916 : 38) reports specimens of *P.h. condorensis* from certain of the small islands off the southeastern coast of Thailand. These are not in the collection of the British Museum (Natural History) and although the same size as the adult from Koh Som, from the description some examples differ from the Koh Som specimens in the colour of the underparts. Unfortunately, Andersen did not mention the colour of the crown and nape. Insufficient material is available to demonstrate the extent of colour variation in *condorensis*, and for the present specimens from Koh Som are left unallocated to subspecies.

They are very similar in colour and size to *P.h. geminorum*, so far known from the islands of the west coast of the Peninsula from Paya, off Kedah, States of Malaya, north to the Mergui Archipelago, whence there are specimens in the British Museum (Natural History) from the islands of Barwell, Sir John Hayes, Malcolm and the Gregory group. The adult female from Koh Som corresponds to the hair brown phase of *geminorum* noted by Andersen (1912 : 107): the bright chestnut mantle contrasts with the dark seal brown mantle usual in this phase of *geminorum*, but a

similar condition is exhibited by a specimen from Sir John Hayes Island. The two younger specimens correspond to the black-bellied phase noted by Andersen (p. 106). *Pteropus hypomelanus* is found predominantly on islands and has yet to be recorded from the mainland of the Malay Peninsula. It is of interest therefore to report the occurrence of similar populations on small islands lying off the eastern and western coasts at approximately the same latitude.

*Cynopterus sphinx angulatus* Miller, 1908

THAILAND: Doi Pha Hom Pok, Fang, Chiangmai, 6,800 feet, c. 18° 47' N., 98° 59' E. 1 ♂, 2 ♀♀.

Doi Ithanon, Chom Thong, Chiangmai, 1,700 metres. 18° 35' N., 98° 29' E. 1 ♂.

Phu Nam Tok Tap Kwang, Kaeng Khoi, Sara Buri, c. 14° 21' N., 100° 52' E. 1 ♀.

Bang Phra, Siracha, Chonburi, 13° 12' N., 100° 57' E. 22 ♂♂ (3 young), 25 ♀♀.

Koh Klet, Pak Klet, Nonburi, 11 miles north of Bangkok. 1 ♂, 1 ♀.

Lumpinee, Bangkok. 1 ♂, 1 ♀.

CAMBODIA: Prek Tasek, 8 kilometres northwest of Phnom Penh. 1 ♀. Siem Reap. 1 ♀.

In his monographic study of the Megachiroptera, Andersen (1912) recognized a single species of *Cynopterus*, *C. brachyotis*, in the Malay Peninsula, with two sympatric subspecies, one, *C.b. brachyotis*, with shorter ears and rostrum, the other, *C.b. angulatus*, having longer ears and rostrum. According to Andersen, both occur in Sumatra and throughout much of the Peninsula but *C.b. angulatus* alone extends north of the Peninsula as far as northern Thailand. Neither was thought by Andersen to have any close affinity to the Indian and Javan species *C. sphinx* which he thought occurred on the mainland as far east as northern Thailand (where according to Andersen it is to be found sympatrically with *C.b. angulatus*), although a subspecies, *C.b. titthaechilus*, was recognized by this author in Java.

However, Kloss (1911 : 185) listed *angulatus* as a distinct species, noting an affinity to *C. sphinx* and suggesting that *angulatus* should be regarded as the southern race of the Indian species. Later, Robinson and Kloss (1915a : 133, 1915b : 114) reiterated this suggestion as a logical conclusion, although in both instances these authors follow Andersen in listing *angulatus* as a subspecies of *brachyotis*. This led to an exchange of opinion-by Andersen and Kloss (1915 : 220) in which the views of Andersen seem rather doubtfully to prevail. His opinion is published again in Kloss (1916 : 40), who provides further (p. 41) comments on specimens from the islands off southeastern Thailand among which Andersen had identified both *C.b. brachyotis* and *C.b. angulatus*. Kloss clearly remained unconvinced and later (1917 : 300; Robinson and Kloss, 1918 : 26; Kloss, 1919 : 361) reverted to the view that *angulatus* represented a distinct species. Subsequently, Chasen (1940 : 25) considered *angulatus* to be a large subspecies of *brachyotis* occurring only in the north of the Malay Peninsula and in some nearby islands, a view adopted by Hill (1961 : 630) and Medway (1969 : 12).

It is evident from the literature that specimens from southern Thailand are critical to any study of the status of *angulatus*. Sanborn (1952 : 2) for example

referred specimens from Kwan Don Setul (=Satun) Province to this form but pointed out that some of the specimens examined had ears and rostra which agreed with *C. sphinx*. In fact, this series reported by Sanborn from a locality almost on the border with Malaya has measurements (length of forearm 61.0-72.4, of ear 16.5-22.0) indicating that it includes both *angulatus* and *brachyotis*. These appear to occur together in Perak, in the northern States of Malaya (Andersen, 1912 : 614; Hill, 1961 : 630); on Koh Lak, off the northeastern part of the Malay Peninsula in southern Thailand (Gyldenstolpe, 1916 : 9); on the islands off southeastern Thailand (Andersen, in Kloss, 1916 : 40); and now, in the present collection, at Bang Phra, Siracha, yet further north.

Furthermore, specimens of *brachyotis* have been obtained at Khao Luang, Nakhon Si Thamrat, on the eastern side of the Peninsula, which is north of Trang, the type locality of *angulatus*, on the opposite side of the Peninsula. More material than was available to Andersen now exists in the collection of the British Museum (Natural History): in particular, there are good series of specimens from central Burma, from Tenasserim (Wroughton, 1915 : 703) and the Mergui Archipelago (Lindsay, 1927 : 44), from central and northern Thailand, and from the Malay Peninsula (Hill, 1961 : 630).

The specimens now available from this critical area divide into two groups, one of larger examples with longer forearms and ears, the other group with generally shorter forearms and shorter ears (the length of the ear as given here is from the meatus, measured personally or for dry specimens by the collector). These correspond to *angulatus* and *brachyotis* as these are defined by Andersen (1912). It is difficult to postulate so extensive an area of intergradation in order to maintain the opinion that *angulatus* and *brachyotis* are conspecific. There are two alternatives to the view that *angulatus* is a subspecies of *brachyotis*, namely that it is a species distinct from either *brachyotis* or from *sphinx*; or that it is a subspecies of *sphinx*. The latter alternative is adopted here and is supported by the long series of specimens from Burma and Thailand which show that the criterion of rostral length used by Andersen to separate *angulatus* and *C. sphinx* is by no means as exclusive as was thought by that author.

Andersen (pp. 600, 612) considered that *angulatus* might be distinguished from *C.s. sphinx* by a shorter rostrum, its length in *angulatus* being less than one quarter of the total length of the skull, in *sphinx* one quarter or more. The rostral lengths of specimens from India (*C.s. sphinx*, *C.s. gangeticus*), Burma (*C.s. sphinx*), Thailand, Malaya and Sumatra (*angulatus*) and Java (*C.s. titthaecheilus*) are compared graphically against total skull length in Figure 1, the dotted line demonstrating those points at which the rostral length is one quarter of the total skull length. There is no clear separation between Indian, Burmese and Thai specimens and, indeed, in *sphinx* from Ceylon and *titthaecheilus* from Java the length of the rostrum is not infrequently less than one quarter of the total length of the skull. The specimens obtained by Dr. Marshall in Thailand are very slightly smaller than *C.s. sphinx* and have relatively slightly shorter rostra, in these features resembling specimens from Tenasserim and the Malay Archipelago.

There appears to be no exclusive external or cranial feature by which *C. sphinx*

can be separated from *C. brachyotis*, a difficulty recognized by Andersen (1912 : 609) who noted that the numerous subspecies of *C. brachyotis* taken together could be separated from the modifications of *C. sphinx* only by their relatively shorter ears. *Cynopterus sphinx* is distributed from India and Ceylon through Burma, Thailand and Indochina to Hong Kong: it extends in the Malay Peninsula as far south as Perak and thence to Sumatra, Java and Timor. Occurring more frequently on islands, *C. brachyotis* extends from Borneo and the Philippine Islands to Java, Sumatra, the Malay Peninsula and its adjacent islands northwards at least as far as southern Thailand and North Vietnam (*C.b. hoffeti* Bourret, 1944), occurring also on the Nicobar Islands and Ceylon. Although on occasion some subspecies (*C.b. scherzeri* from the Nicobar Islands, *C.b. insularum* from Kangean and Mata Siri Islands, off Java) approach or equal the smaller of *C. sphinx* in size, such subspecies have the characteristically smaller ears of *brachyotis*.

There is some overlap between the two species in the area of sympatry from Thailand to Sumatra in both length of forearm and ear, and although a definitive line cannot be drawn for either character, the majority of specimens can be separated readily by a combination of these parameters, which are compared for Burma, Tenasserim, Thailand and Indochina in Figure 2 and for Malaya and Sumatra in Figure 3. A comparable comparison of specimens of *sphinx* and *brachyotis* from Ceylon and Java appears in Figure 4. On the mainland and in Sumatra, the

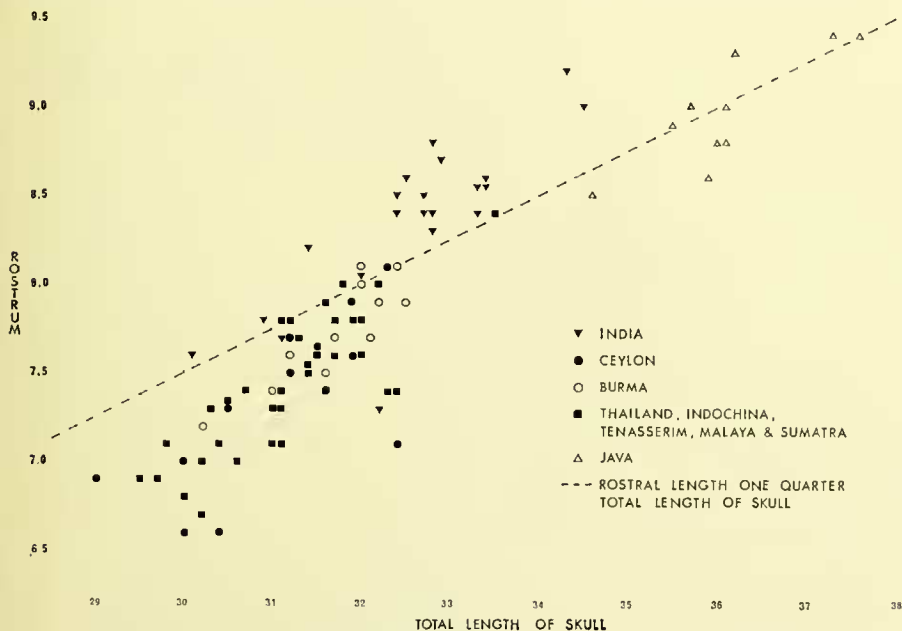


FIG. 1. Length of skull and rostrum (front of orbit to nares) in *Cynopterus sphinx*.

forearm length of specimens referable to *sphinx* generally exceeds 65 mm. and the length of the ear is greater than 19.0 mm., while specimens referable to *brachyotis* have forearm and ear lengths only rarely exceeding these values.

The large number of specimens from Thailand show that *C.s. angulatus* has ears that in length considerably exceed the maximum value of 18.0 mm. which Andersen (1912 : 612) noted for *angulatus* when he allocated it to *brachyotis* as a subspecies. In this connection it should be noted that Andersen stated (p. 612) of *angulatus* that the measurement of the ear is from the orifice, yet in the typical series measured by Miller (1898 : 318) the length of the ear from the meatus is given as 18-21 mm. and from the crown 15-18 mm., only the latter being under the maximum given by Andersen for *angulatus*. Still further, the table of measurements in a British Museum (Natural History) copy of Miller (1898) has been annotated (p. 318) by Andersen to the effect that he has examined the first six specimens tabulated. The



FIG. 2. Length of forearm and ear in *Cynopterus sphinx* and *C. brachyotis*.



first of these (U.S. National Museum 83,524) with forearm of 61 mm. and ear 18.4 mm. he notes as *C.s.* (sic) *brachyotis*, the remainder as true *angulatus*, thus demonstrating that the two forms occur together at the type locality of *angulatus*, Trang, in southern Thailand.

The montane subspecies *C. brachyotis altitudinis* Hill, 1961, from Mount Brinchang, Perak has generally longer ears than *C.b. brachyotis*, reaching a maximum of 20 mm., but has a short forearm only exceptionally reaching a maximum length of 67 mm. Furthermore, it is linked to *C.b. brachyotis* from the surrounding lowlands by intermediates (Hill, 1961 : 632).

Chasen (1940 : 25) listed the large *C. major* Miller, 1902, from Nias Island, off west Sumatra as a subspecies of *sphinx*. Andersen (1912 : 630) considered it a representative of '*C. brachyotis angulatus*' on account of its ears which he noted (p. 629) as 16.5-18 mm. in length, but Chasen (p. 29) measured the length of the ear at 18.5-20 mm.

### *Cynopterus brachyotis brachyotis* (Müller, 1838)

THAILAND: Khao Luang, Nakhon Si Thamrat, 1,300 feet, 8° 26' N., 99° 58' E.  
3 ♂♂ (1 young), 1 ♀.

Bang Phra, Siracha, Chonburi, 13° 12' N., 100° 57' E. 1 ♂, 5 ♀♀.

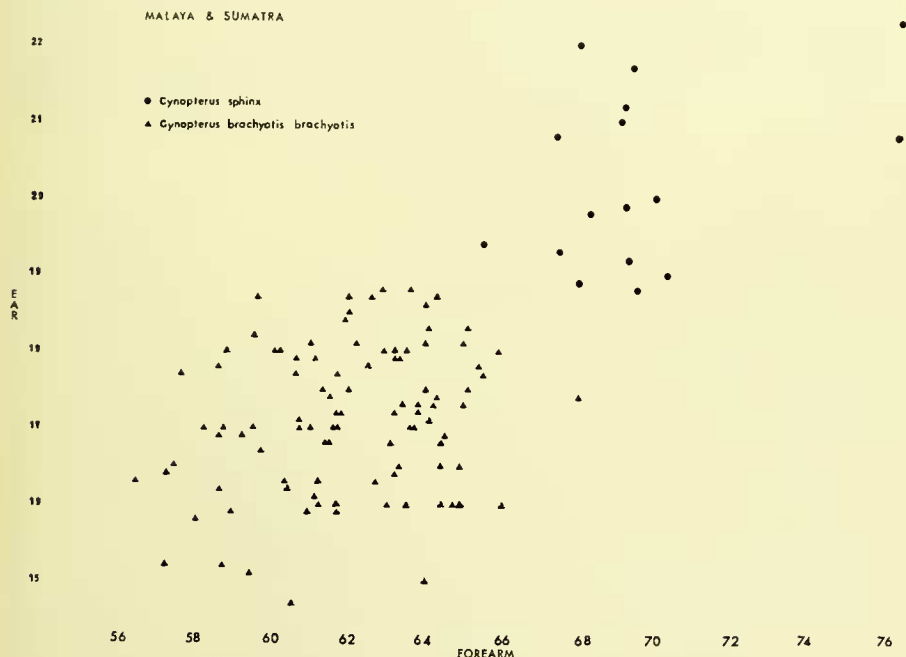


FIG. 3. Length of forearm and ear in *Cynopterus sphinx* and *C. brachyotis*.

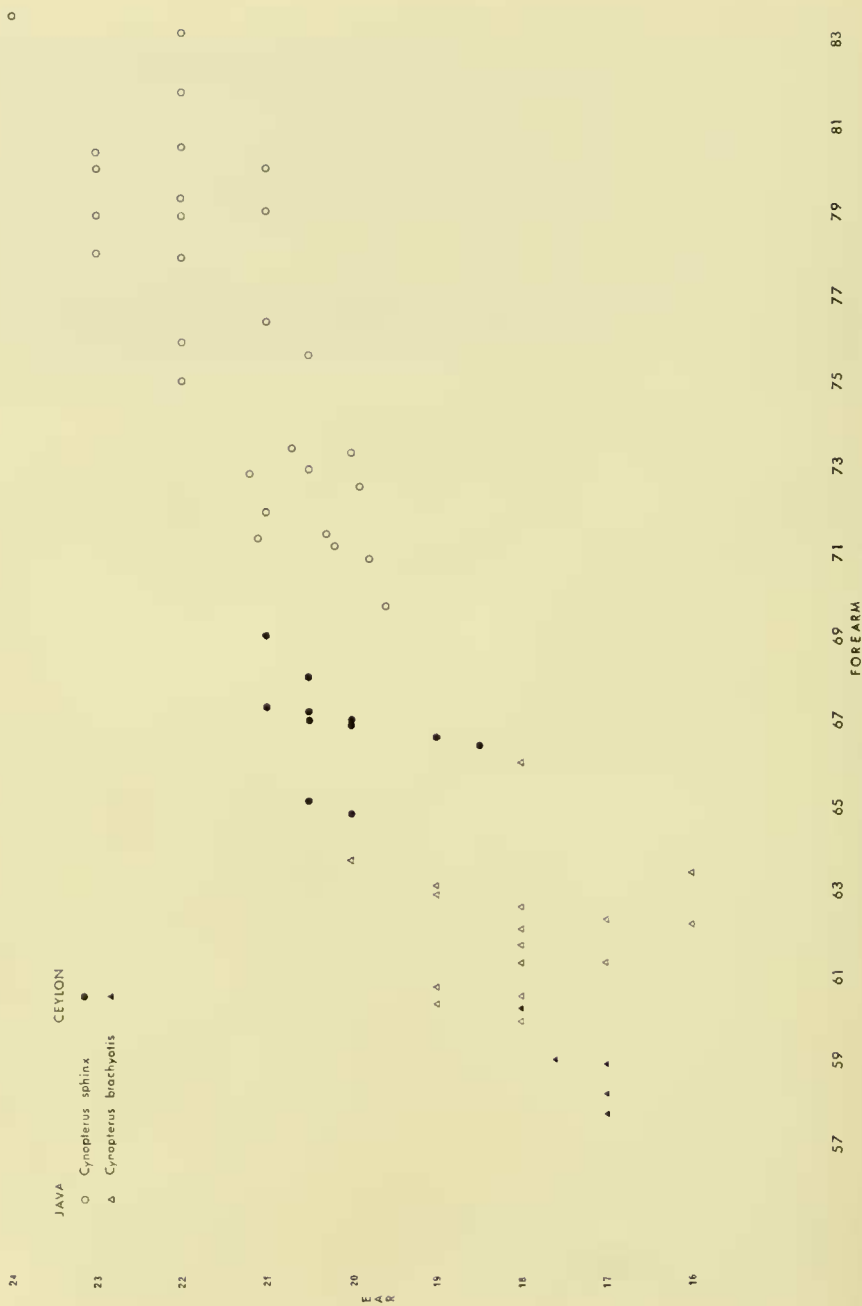


FIG. 4. Length of forearm and ear in *Cynopterus sphinx* and *C. brachyotis*.

These specimens agree exactly with *C.b. brachyotis* from the southern part of the Malay Peninsula: those from Bang Phra constitute the northernmost record in Thailand: *C.b. brachyotis* occurs also on the islands of Chang, Mehsi East, Kra, Klum, Kut and Lak in the Gulf of Siam.

***Megaerops ecaudatus*** (Temminck, 1837)

THAILAND: Khao Luang, Nakhon Si Thamrat, 1,300 feet, 8° 26' N., 99° 58' E.  
1 ♂, 1 ♂.

Doi Pha Hom Pok, Fang, Chiangmai, 6,800 feet, 18° 47' N., 98° 59' E. 1 ♂.

This species apparently has not been recorded hitherto from Thailand although known from Malaya (Bonhote, 1903 : 15; Hill, 1961 : 636) and both North and South Vietnam (Van Peenen, Ryan and Light, 1969 : 41).

***Chironax melanocephalus*** (Temminck, 1825)

THAILAND: Khao Luang, Nakhon Si Thamrat, 1,300 feet, 8° 26' N., 99° 58' E.  
1 ♀.

No skull is available to confirm the identification of this specimen as *C. melanocephalus*, but it has the characteristically darker head of that species with bright orange patches at the sides of the throat just anterior to the shoulders. *Chironax melanocephalus* has been reported from Selangor (Chasen, 1940 : 30, Hill, 1961 : 640) and, more recently, specimens (B.M.67. 1484-1488) have been received from Gunong Benom, Pahang, but the species has not before been reported from Thailand. The specimen from Khao Luang agrees well with one from Pahang but the head is a little less intensely black, the underside rather more brownish and the orange throat patches less prominent. Length of forearm 47.3.

***Sphaerias blanfordi*** (Thomas, 1891)

THAILAND: Doi Pha Hom Pok, Fang, Chiangmai, 6,800 feet, 18° 47' N., 98° 59' E.  
1 ♀ (young adult).

This species has evidently an extensive range through the montane areas of southeastern Asia. The original material consisted of three examples (one, B.M.90.4.7.6, in the collections of the British Museum (Natural History)) collected by Fea at Leito, Cheba, Karin Hills, Burma at 1,000 metres, while subsequently Allen and Coolidge (1941 : 136) recorded two specimens from Mount Angka (Doi Inthanon), in northern Thailand, at 4,000 feet. More recently, Bhat (1968 : 471) has recorded *S. blanfordi* from various Indian localities in Uttar Pradesh, at elevations ranging from 800 to 2,710 metres. Measurements of the specimen from Doi Pha Hom Pok: length of forearm 52.0; total length of skull 27.8; condylobasal length — ; condylocanine length — ; length orbit to nares 7.0; lachrymal width 7.0; least interorbital width 5.3; postorbital width 6.7; zygomatic width 15.5; diameter of orbit 6.5; braincase width 11.8; mastoid width 11.3; c<sup>1</sup>-c<sup>1</sup> 5.8; least width between bases of canines 3.1, p<sup>4</sup>-p<sup>4</sup> 5.3, least width between p<sup>4</sup>-p<sup>4</sup> 4.7; m<sup>1</sup>-m<sup>1</sup> 7.5; least width between m<sup>1</sup>-m<sup>1</sup> 5.6; width mesopterygoid fossa 3.8; c-m<sup>1</sup> 8.6; length of mandible 19.9; coronoid height 7.7; c-m<sub>2</sub> 9.8.

*Macroglossus minimus sobrinus* Andersen, 1911

THAILAND: Doi Inthanon, Chom Thong, Chiangmai, 1,700 metres, 18° 35' N., 98° 29' E. 1 ♀.

Ban Bangmakham, Koh Samui, Surat Thani, 9° 30' N., 100° 00' E. 1 ♂,

Khao Luang, Nakhon Si Thamrat, 1,300 feet, c. 8° 26' N., 99° 58' E. 1 ♂, 1 ♀ (young).

Ellerman and Morrison-Scott (1951 : 101) do not include Thailand in the distribution of *M. minimus* although the species is listed by these authors from Tenasserim. However, Horsfield (1851 : 29) lists a specimen in the Museum of the East India Company collected in Thailand by Finlayson, apparently the same specimen listed subsequently from the Indian Museum by Anderson (1881 : 107), and Bonhote (1903 : 15) records a specimen from Patani, in southern Thailand.

*Taphozous theobaldi theobaldi* Dobson, 1872

THAILAND: Sara Buri. 1 ♂.

Khao Lom Phat, 21 kilometres eastnortheast of Sara Buri. 1 ♀.

Described from Tenasserim, *T. theobaldi* was listed from Thailand by Pousargues (1904 : 544) and has been recorded subsequently from North Vietnam (Bourret, 1944 : 9) and South Vietnam (Van Peenen, Ryan and Light, 1969 : 50). Measurements (♂, ♀): length of forearm 74.0, 74.1; greatest length of skull 24.2, 23.6; condylocanine length 23.9, 23.5; least interorbital width 7.5, 7.0; postorbital width 5.2, 5.3; zygomatic width 14.3, 14.1; braincase width 10.8, 11.1; mastoid width 12.8, 12.6; c<sup>1</sup>-c<sup>1</sup> 4.9, 4.8; m<sup>3</sup>-m<sup>3</sup> 10.2, 10.1; c-m<sup>3</sup> 10.7, 10.5; length of mandible 18.7, 18.5; c-m<sub>3</sub> 11.8, 11.7.

*Taphozous longimanus longimanus* Hardwicke, 1825

CAMBODIA: Prek Phnau, 6 kilometres northeast of Phnom Penh. 2 ♀♀.

Cambodia, no certain locality. 5 ♀♀.

*Taphozous longimanus* has not hitherto been reported from Cambodia although known to occur in Tenasserim (Wroughton, 1915 : 706) and further north in Burma (Wroughton and Davidson, 1918 : 477, Wroughton, 1918b : 25). The wings of these specimens are dusky, and they are referred to the nominate subspecies rather than to the pale-winged *T.l. albiplinnis* from the Malay Peninsula, Sumatra and Borneo. Length of forearm 62.0, 62.3; of five females of uncertain provenance 60.5-63.1 (61.5).

*Rhinolophus affinis macrurus* Andersen, 1905

THAILAND: Doi Inthanon, Chom Thong, Chiangmai, 18° 35' N., 98° 29' E. 1 ♂.

Ban Papae, Mae Sariang, Mae Hong Son, 2,365 feet, c. 18° 45' N., 97° 55' E. 1 ♂.  
Now Senckenberg Museum No. 33816.

Longer tails (c. 26-29 mm.) refer these specimens to *R. a macrurus* rather than to *R. a superans* from the Malay Peninsula.

*Rhinolophus malayanus* Bonhote, 1903

THAILAND: Phu Nam Tok Tap, Kwang, Kaeng Koi, Sara Buri c. 14° 12' N., 100° 52' E. 1 ♀.

First described from Biserat, in Jalor, southern Thailand, the range of this species has since been extended to include Perlis, in the northern States of Malaya (Hill, in press), Pulau Langkawi, off the west coast of the Malay Peninsula (Hill, in press), Koh Lak, off the east coast of southern Thailand (Gyldenstolpe, 1916 : 13); Laos (Andersen, 1905: 89, Tate and Archbold, 1939: 6; Phillips, 1967: 634) and tentatively North Vietnam (Osgood, 1932 : 218). Measurements of the specimen from Sara Buri: length of forearm 40.1; greatest length of skull 18.3; greatest length to canine 17.3; condylocanine length 15.2; supraorbital length (distance from junction of supraorbital ridges to median anterior point of nasal swellings) 5.0; least inter-orbital width 1.9; zygomatic width 8.7; braincase width 7.4; mastoid width 8.3;  $c^1-c^1$  4.2;  $m^3-m^3$  6.4;  $c-m^3$  6.7; length of mandible 11.3;  $c-m_3$  7.0.

Phillips (1967 : 634) considers that on the basis of the published description it is probable that *Rhinolophus chaseni* Sanborn, 1939 from Con Son Island (Pulo Condore), off the southeastern coast of South Vietnam will prove conspecific with *R. malayanus*. Elsewhere, one of us (Hill, in press) has indicated that *chaseni* (probably the bat reported from Con Son as *R. minor* by Pousargues, 1904 : 544) is not closely related to *malayanus* as was suggested by its describer but instead should be considered a subspecies of *R. borneensis*. *Rhinolophus malayanus* differs from *R. borneensis* chiefly in the form of the anterior nasal swellings: in *malayanus* the median swellings are large and much inflated, extending laterally down the sides of the rostrum to the extent that the lateral swellings are relatively small, while in *borneensis* the median swellings are smaller and less inflated, not extending laterally down the sides of the rostrum, with the lateral swellings conspicuously larger than in *malayanus*. Examination of the holotype of *chaseni* shows it to belong with *borneensis* rather than with *malayanus*.

*Rhinolophus shameli* Tate, 1943

THAILAND: Ban Bon Dan, kilometre 58, Route 23, Korat, 400 metres. 1 ♂.

CAMBODIA: Preah Khan, Siem Reap, 3 ♂♂. 1 ♀.

Shamel (1942 : 319) referred two specimens from Thailand in the Smithsonian Institution to *R. coelophyllus* Peters, 1867, a species rare in collections and characterized by the unique hood-like appearance of the posterior nose-leaf, the connecting process entering a vertical fissure in its anterior face. The two specimens reported by Shamel, however, differed sufficiently from each other in a number of respects that this author described them individually. Subsequently, Tate (1943 : 2) considered that one, from the island of Chang in the Gulf of Siam, merited sub-specific separation as *R.c. shameli* when compared with the other specimen, obtained at Chiangmai in northern Thailand. Apart from these specimens, *R. coelophyllus* has been reported from the Salween River (the type locality); from Tsagine (Sagain), Upper Burma (Ellerman and Morrison-Scott, 1951 : 123); from Koh Lak off the

east coast of southern Thailand (Gyldenstolpe, 1911 : 16) and from the States of Malaya (Chasen, 1940 : 42). The specimens now reported from Thailand and Cambodia, however, together with others obtained recently on Pulau Langkawi, off the west coast of the Malay Peninsula, suggest that *shameli* represents a distinct species.

According to Shamel (1942 : 319) the specimen from Koh Chang (*shameli*) is much more brightly coloured than that from Chiangmai and differs also in the configuration of the upper surface of the rostrum, which posteriorly to the nasal swellings is flat and not excavated, the margins formed by the division and forward extension of the sagittal crest not ridged or beaded. In the specimen from Chiangmai this region is scooped out, the margins of this depression formed by strong, beaded supraorbital ridges developed from the forward extension and division of the sagittal crest. Tate (1943 : 3) in describing the specimen from Koh Chang as *shameli* points out that it is considerably larger than the example from Chiangmai, as can be seen from the measurements published by Shamel, and also that it has hypsodont teeth, these features together with its more brilliant coloration forming the basis of his diagnosis.

The specimen reported here from Ban Bon Dan agrees closely in colour with the description by Shamel (1942 : 319) of the example from Koh Chang subsequently designated as the holotype of *shameli* by Tate. The head is dark brown to the anterior bases of the ears: the remainder of the dorsal surface is bright golden brown, anteriorly slightly more brilliant, posteriorly a little browner. The individual hairs are pale cream for most of their length, tipped with the brighter colour. The ventral surface is paler, overall orange buff, lacking brown, the hairs orange buff at the base and for most of their length, with brighter tips. Cranially, the specimen agrees exactly with the description by Shamel of the Koh Chang example, the upper surface of the rostrum flat and not margined by prominent supraorbital ridges.

Specimens from Cambodia (whence neither *coelophyllus* nor *shameli* have been reported hitherto) and Upper Burma agree in size and rostral features with *shameli* but differ in colour. These specimens are brown dorsally, the individual hairs pale greyish white at the base: the ventral surface by contrast is very much paler, the throat, chest and belly pale buff, the hairs creamy white at the base and tipped with buff or buff brown. The flanks and inguinal region are slightly darker, the hair tips brown and lacking any buff. Since in all other respects these specimens agree exactly with *shameli* they support the view that this species exists in a brownish phase and a contrasting brighter, more reddish phase, a phenomenon not uncommon in *Rhinolophus*.

The collections of the British Museum (Natural History) include one example from Kedah and two from Pulau Langkawi which agree closely in colour with the specimens from Cambodia and Upper Burma referred here to *shameli* and with the description of a single specimen from Chiangmai reported by Shamel (1942 : 319): those from Langkawi (in alcohol) are very slightly browner ventrally than those from Cambodia. However, the three specimens are very much smaller than *shameli* and the upper surface of the rostrum is in each deeply excavated behind the nasal swellings, the depression enclosed laterally by prominent supraorbital ridges formed

from the anterior division of the sagittal crest, while all have less massive teeth. In these respects, they thus resemble precisely the specimen described from Chiangmai by Shamel which Tate (1943 : 3) noted was 'probably referable to the type from Salween River, Burma'. The type specimen of *coelophyllus* is small (forearm length 42, according to Peters, 1867a : 427) and for the present this name is used for the smaller species to which the Chiangmai, Kedah and Langkawi specimens belong. Those from Koh Lak reported by Gyldenstolpe (1911 : 16) are cranially a little smaller and may represent an undescribed subspecies of *R. coelophyllus* as Tate (p. 3) suggests. Measurements of *R. shameli* and *R. coelophyllus* are compared in Table 1.

### *Rhinolophus acuminatus* Peters, 1871

THAILAND: Chonburi, 13° 22' N., 100° 59' E. 1 ♂, 2 ♀♀ (1 young).

Bang Phra, Siracha, Chonburi, 13° 12' N., 100° 57' E. 2 ♂♂ (1 now Senckenberg Museum No. 33817).

1 ♀ CAMBODIA: Preah Khan, Siem Reap. 3 ♂♂, 1 ♀.

*Rhinolophus acuminatus* is recorded from Thailand and Laos by Dobson (1878 : 878) and Pousargues (1904 : 544) and from Thailand by Shamel (1942 : 321) and Sanborn (1952 : 3): these specimens from Preah Khan constitute the first record of the species from Cambodia. Specimens from Thailand and Cambodia agree very closely in colour and size with an extensive series of *R.a. acuminatus* (to which Thai specimens are referred by Shamel and by Sanborn) from Java. Six examples (including three from Cambodia) are in the dark or grey phase, the dorsal pelage greyish brown, the hairs tipped light grey or silver, especially anteriorly: the ventral surface is pale grey. Three (including one from Cambodia) display the red or russet phase and are dorsally reddish brown, ventrally a little paler. A single example exhibits a condition midway between these extremes: the anterior part of the back is greyish brown, tinged with russet, the posterior back russet, while the ventral surface is suffused with russet yet retains much of its greyish tinge.

Although there is a good series of *R.a. acuminatus* in the British Museum (Natural History), the remaining subspecies, *R.a. audax* from Lombok, the Sumatran *R.a. sumatranus*, *R.a. calypso* from Enggano Island, off Sumatra and *R.a. circe* from nearby Nias Island are as yet only very poorly represented. Furthermore, Chasen and Kloss (1932 : 48) identify as *R. acuminatus* a specimen from Sabah, Borneo which Chasen (1940 : 39, footnote) suggested might represent an undescribed subspecies, provisionally associating it with *R.a. sumatranus*. Allen and Coolidge (1940 : 136) did not allocate specimens from Mount Kinabalu to subspecies, but Medway (1965 : 54) lists Bornean specimens as *R.a. sumatranus*. In these circumstances it is difficult to assess subspecific variation in *R. acuminatus* and for the present mainland specimens are left unallocated.

### *Rhinolophus borneensis* Peters, 1861

CAMBODIA: Preah Khan, Siem Reap. 2 ♂♂.

There appears to be but one previous report of *R. borneensis* from the mainland of southeastern Asia, by Robinson and Kloss (1915b : 116), who tentatively identified

TABLE I  
Measurements of *Rhinolophus shameli*, *R. coelophyllus*

	Sex	Length of forearm	Greatest length of skull	Condylabasal length	Greatest length to canine	Condylacanthine length	Width across nasal swellings	Rostral width	Least inter-orbital width	Zygomatic width	Braincase width	Braincase depth	Mastoid width	C <sub>1</sub> -C <sub>1</sub>	m <sup>3</sup> -m <sup>3</sup>	C-m <sup>3</sup>	Length of mandible	C-m <sup>3</sup>	Location
<i>R. shameli</i>	♂	46.2†	21.0	18.6	—	—	5.6	—	2.0	9.0	8.5	6.6	—	—	—	8.0†	—	8.5	Holotype, Koh Chang
U.S.N.M. 267255*	♀	45.7	—	—	—	—	—	—	—	—	—	—	—	—	—	7.6	12.6	—	Upper Burma
9.1.4.14	♀	46.4	20.7	18.4	19.8	17.6	5.5	5.5	—	9.5	8.9	6.0	9.4	5.1	6.9	7.9	12.6	7.9	"
76.5.26.2	♀	41.7	—	—	19.1	16.7	5.3	5.2	2.0	9.4	8.3	5.8	9.2	5.1	6.7	7.5	12.1	7.8	Korat, Thailand
J.T. Marshall	♂	45.8	20.4	18.1	20.0	17.5	5.5	5.5	1.9	9.9	8.8	5.9	9.6	5.1	7.3	7.8	12.8	8.3	Cambodia
Paris Mus.	♀	46.2	19.9	18.1	19.5	17.4	—	5.3	1.8	9.9	8.4	6.0	9.4	4.8	7.2	7.8	—	8.1	"
"	♀	46.2	20.7	18.6	20.1	17.7	5.5	5.4	2.1	9.9	8.7	5.7	9.6	4.8	7.1	7.9	—	8.3	"
"	♂	46.4	20.7	18.5	20.0	17.7	5.4	5.3	1.8	9.7	8.6	5.8	9.5	5.0	7.0	7.5	—	8.1	"
<i>R. coelophyllus</i>	♂	41.0†	19.0	17.5	—	—	5.2	—	2.0	9.0	8.2	5.2	—	—	—	7.5†	—	7.6	Chiangmai, Thailand
U.S.N.M. 267260*	♀	42.9	—	—	18.8	16.3	4.9	4.8	2.2	9.5	8.3	5.6	9.2	4.6	6.6	7.2	11.9	7.5	Kedat
98.10.1.1.	♂	42.7	19.4	17.2	18.7	16.7	5.0	4.9	2.1	9.4	8.6	5.8	9.2	4.7	6.7	7.3	—	7.6	Langkawi
68.821	♂	44.7	19.4	17.3	18.8	16.6	5.0	4.9	1.9	9.6	8.7	5.7	9.2	4.7	6.8	7.2	11.9	7.5	"
68.822	♂	41.2	17.6	15.5	—	—	4.2	—	—	8.1	7.6	—	8.1	—	—	6.5	11.0	7.0	Koh Lak
Gyldenstolpe	♂	41.4	—	—	—	—	4.7	—	—	8.1	—	—	8.1	—	—	6.8	—	7.0	"
"	♀	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	"

\* from Shamel † Tate (1942:6) gives 46.0 and 8.5 for these values

‡ " " " " 45.0 " 7.6 " " "



a specimen from Khao Nawng, Bandon, southern Thailand with this species. This specimen, however, later became the holotype of *R. robinsoni* Andersen, 1918. *Rhinolophus borneensis spadix* from the Natuna and Karimata Islands seems only barely separable (Andersen, 1905 : 87) from the Bornean subspecies *R.b. borneensis* by virtue of its very slightly larger ears. Both subspecies, like the Cambodian specimens, are a little larger in some respects than the holotype of *R.b. chaseni* Sanborn, 1939 (see above, under *R. malayanus*) from Con Son Island (Pulo Condore), but measurements of a series of *chaseni* given by Van Peenen, Ryan and Light (1969 : 59) and by Van Peenen, Cunningham and Duncan (1970 : 421) (in which by a lapsus the length of the forearm is given as the greatest skull length, the latter appearing as the zygomatic breadth) approach or overlap those of mainland specimens. It may well be, therefore, that *chaseni* will prove to be the correct subspecific name for the mainland population.

Specimens reported as *Rhinolophus* sp. from North Vietnam by Osgood (1932 : 219) seem perhaps referable to *R. borneensis*. In size they agree with those reported from Cambodia, and Osgood notes that the development of the nasal swellings is perhaps less than in *malayanus*, the skulls agreeing in general robustness with *stheno*. In *borneensis* the median nasal swellings are smaller than those of *malayanus* (see above, under *R. malayanus*), and, so far as mainland specimens are concerned, the skull is generally more robust, similar in this respect to *stheno*. Measurements of the Cambodian specimens, with those of the holotype of *R.b. chaseni* (in parentheses): length of forearm 44.1, 43.4, (41.3); greatest length of skull 19.7, 19.3 (18.7); condylocanine length 17.3; 17.6 (16.5); rostral width 5.3, 5.3, (5.3); width across nasal swellings 5.5, 5.5, (5.5); least interorbital width 2.5, 2.3 (2.5); zygomatic width 9.9, 9.9 (9.3); braincase width 8.3, 8.4 (8.2); mastoid width 9.5, 9.5, (8.8);  $c^1-c^1$  4.8, 4.9 (4.9);  $m^3-m^3$  7.2, 6.8, (6.8);  $c-m^3$  7.7, 7.4, (7.3); length of mandible —, 12.7, —;  $c-m^3$  8.3, 8.0, (7.8).

### *Coelops frithii* Blyth, 1848

THAILAND: Khao Luang, Nakhon Si Thamrat, 1,300 feet, 8° 26' N., 99° 58' E. 1 ♂.

The elongate, narrow outline of the lappets projecting from the supplementary leaflets flanking the anterior noseleaf suggests that this specimen should be referred to *C. frithii* rather than to *C. robinsoni* in which these lappets are rounded and wider. Unfortunately, the skull, which would provide a more definite indication, is missing. Length of forearm 38.2.

Robinson and Kloss (1915b : 116) record two specimens from Khao Nawng, Bandon, southern Thailand as *C. robinsoni*. These, formerly in the collection of the Federated Malay States Museum (531/12, 532/12), are now in the collections of the British Museum (Natural History) (B.M. 68. 605-606). Elsewhere, one of us (Hill, in press), in a review of the species of *Coelops*, has shown these to be examples of *C. frithii*, which is recorded from Chiangmai by Gyldenstolpe (1916 : 15) and listed from Laos by Pousargues (1904 : 544).

*Myotis hasseltii continentis* Shamel, 1942

CAMBODIA: Prek Phnau, 6 kilometres northeast of Phnom Penh. 3 ♂♂, 3 ♀♀.

Large-footed *Myotis* of southeastern Asia stand in need of revision, but at the present time there is insufficient material in the collections of the British Museum (Natural History) from a suitably wide range of localities for this to be undertaken in detail. Specimens attributed to the named forms *horsfieldii*, *hasseltii*, and *adversus* have been reviewed recently (Hill, in press) and there seems little doubt that *M. horsfieldii* (Temminck, 1840) must be considered a distinct species (Medway, 1965 : 60) on account of its small size, blackish coloration and narrow braincase when compared with *hasseltii* and *adversus*. *Myotis deignani* Shamel, 1942, from Chiangmai, northern Thailand seems likely to be a subspecies of *horsfieldii*. *Myotis hasseltii* (Temminck, 1840) applies apparently to larger specimens in which the pelage is short, the post-palatal extension short and lacking thin bony laminae to support the post-palatal spine, in which  $i^2$  and  $i^3$  are relatively massive, the second upper premolar ( $pm^3$ ) is minute, usually intruded from the toothrow and the second lower premolar ( $pm_3$ ) very small, intruded from the toothrow sometimes to the extent that  $pm_2$  and  $pm_4$  are in contact or nearly so. *Myotis adversus* (Horsfield, 1824) is characterized by dense, woolly pelage, a long post-palatal extension with thin bony laminae supporting the post-palatal spine,  $pm^3$  less reduced, usually not much intruded from the toothrow and with  $pm_3$  although reduced, in the toothrow or only very slightly intruded.

*Myotis hasseltii* is distributed from Ceylon, Thailand and Indochina to Malaya, Java and Borneo. Specimens from Thailand and Cambodia agree closely with the description of *Myotis adversus continentis* Shamel, 1942 : 323 which apparently is referable to *hasseltii* rather than to *adversus*. Shamel says 'fur velvety and short':  $pm^3$  is crowded inwards, with  $pm^2$  and  $pm^4$  in contact, while  $pm_3$  is small, but in the holotype standing in the toothrow. According to Medway (1965 : 62) *M.h. macellus* (Temminck, 1835) is the Bornean subspecies. *Myotis adversus* occurs in Java (*M.a. adversus*) and Borneo (*M.a. carinatae* Miller, 1906) east to Australia (*M.a. moluccarum* (Thomas, 1915) ).

Minimum, maximum and mean length of forearm in five specimens of *M. hasseltii continentis* from Cambodia 36.8–39.2 (38.2); measurements of three skulls (♂, ♀♀): greatest length 15.3, 15.7, 15.8; condylobasal length 14.4, 14.6, 14.6; least interorbital width 4.2, 4.1, 4.0; zygomatic width 10.2, 9.9, 10.2; width of braincase 7.8, 7.6, 7.8; mastoid width 8.6, 8.4, 8.6;  $c^1$ – $c^1$  4.3, 4.3, 4.3;  $m^3$ – $m^3$  6.1, 6.2, 6.0;  $c$ – $m^3$  5.5; 5.6, 5.7; length of mandible –, 11.1, 10.9;  $c$ – $m_3$  6.1, 6.1, 6.2.

*Myotis annectans* (Dobson, 1871)

THAILAND: Doi Pui, Chiangmai, 1,250 metres. 1 ♀. Collected by Kittu Thonglongya and now in the Thai National Reference Collection.

Topal (1970a) has recently examined the holotype of *Pipistrellus annectans* Dobson, 1871: 213 from the Naga Hills, Assam, in the Indian Museum, Calcutta and concluded that despite the absence of the small second premolars ( $pm^3$ ) it should be referred to *Myotis*. Furthermore, Topal has concluded that it is synonymous

with *Myotis primula* Thomas, 1920 : 248 from Pashok, near Darjeeling, northeastern India, which it antedates by many years. A result of this conclusion is that the subgeneric name *Megapipistrellus* Bianchi, 1917 with type species *Pipistrellus annectans* Dobson must be transferred to *Myotis*. Apart from the original, the only other record of *P. annectans* seems to be the report by Schneider (1905 : 80) of three specimens identified by Leche from the Upper Langkat, Sumatra and at that time in the Zoological Institute of the University of Stockholm. Schneider gave no diagnostic features but subsequently the specimens were described in detail by Arnböck-Christie-Linde (1909 : 574). They are, however, much too small to be referred to *annectans*.

The specimen from Chiangmai agrees exactly with the description of *Pipistrellus annectans* by Dobson and provides an opportunity to describe the coloration of the species, the holotype being in alcohol, and also to make a direct comparison with the holotype of *Myotis primula*. Dorsally, the Chiangmai specimen is rich dark chestnut brown, the individual hairs dark brown at the base, tipped with paler brown. The ventral surface, including the underside of the head and throat, is greyish for the most part, with brown underlay, the hairs dark brown at the base, heavily tipped with greyish white. The hair tips on the belly are ochraceous or orange to produce an orange yellow median patch. The pelage is rather long and woolly, extending slightly on to the endopatagium but hardly at all on to the uropatagium.

The face is densely hairy, excepting the nostrils and the areas around the lips and eyes, the pelage forming a dense fringe on the forehead. Ears translucent distally, less so proximally, of moderate size with rounded tips. The anterior margin of the ear is strongly convex proximally, less so distally, the posterior margin sharply concave just below the tip, becoming convex, slightly concave again near the base of the tragus, with a small antitragal lobe. The tragus is long and tapering, with an acute, rounded tip, its anterior margin slightly concave, the posterior margin convex and with a small rounded basal lobe. There is no post-calcarial lobe and the extreme tip of the tail is free of the membrane.

The skull has an elongate, uninflated braincase, relatively wide unconstricted interorbital region and slight sagittal crest. The rostrum is low and narrow anteriorly, with shallow median frontal sulcus and short, U-shaped anterior narial emargination. The large anteorbital forearm is separated from the orbit by a moderate bar of bone with a small upper subsidiary foramen within the orbit. The palate is sharply domed, narrowed anteriorly, with U-shaped anterior emargination and wide ligulate post-palatal spine. The inner upper incisor ( $i^2$ ) is large, slightly longer than wide, with large anterior cusp and lower posterior cusp:  $i^3$  is wider than long, transverse to the toothrow, with a heavy cusp rising from a narrow cingulum and separated from the canine by a narrow diastema. Lower incisors with no especial peculiarities, canines low,  $c^1$  about the same height as  $pm^4$ ,  $c_1$  similarly about the same height from the cingulum as  $pm_4$ . Anterior upper premolar ( $pm^2$ ) large, in toothrow, touching  $c^1$  and  $pm^4$ ;  $pm_2$  not reduced or displaced, in contact with  $c_1$  and  $pm_4$ . No trace of  $pm_3^2$  in either jaw. The specimen agrees precisely with the diagnosis by Dobson of *P. annectans*, which it obviously represents.

A direct comparison with the holotype and other material of *Myotis primula*

Thomas, 1920 shows exact agreement in almost every respect. The ears in *primula* are not translucent distally as they are in the Chiangmai specimen which is very slightly more orange ventrally than *primula* but in every other external feature there is complete correspondence. The skulls and teeth agree precisely excepting only for the presence of a minute  $pm\frac{3}{3}$  in *primula*: its degree of intrusion, however, varies in the specimens examined and although in the holotype (B.M.16.3.25.30) the anterior ( $pm\frac{2}{2}$ ) and posterior ( $pm\frac{4}{4}$ ) premolars do not touch, in two others (B.M.20.7.27.2-3) these teeth are in contact or nearly so. There can be no doubt that *annectans* is in fact *primula* in which these teeth have never appeared: the ears and tragus of *annectans* and *primula* refer the taxon which they represent indubitably to *Myotis*, as Topal has concluded. Measurements of *M. annectans* from Chiangmai are compared with those of *M. primula* in Table 2.

TABLE 2

Measurements of *Myotis annectans*

	<i>M. annectans</i> ♀	' <i>M. primula</i> ' ♂	' <i>M. primula</i> ' ♂	' <i>M. primula</i> ' ♀
	Chiangmai, Thailand	Holotype B.M.16.3.25.30 Assam	B.M.20.7.27.2 Assam	B.M.20.7.27.3 Assam
Length of forearm	43.3	47.0	46.5	45.2
Greatest length of skull	17.0	17.3	16.7	—
Condylobasal length	16.4	16.7	15.9	—
Condylocanine length	15.3	15.6	14.9	—
Least interorbital width	4.2	4.3	4.3	4.2
Zygomatic width	11.2	11.5	—	—
Braincase width	8.0	8.4	8.6	7.8
Mastoid width	8.8	8.6	8.5	8.4
$c^1-c^1$	4.5	4.8	4.8	4.6
$m^3-m^3$	7.6	7.3	7.4	7.2
$c-m^3$	6.7	6.9	6.6	6.7
Length of mandible	12.3	12.7	—	—
$c-m_3$	7.3	7.3	7.1	7.2

*Myotis siligorensis thaianus* Shamel, 1942

THAILAND: Tham Tab Tao, Fang, Chiangmai. 2 ♂♂. Thai National Reference Collection.

These are apparently the first of *M.s. thaianus* to be reported since its description from Chiangmai by Shamel (1942: 323). Measurements: length of forearm 31.7, 31.9; greatest length of skull 12.8, 12.7; condylobasal length 11.8, —; condylocanine length 11.1, —; least interorbital width 2.8, 2.9; zygomatic width 7.0, —; braincase width 5.8, 6.0; mastoid width 6.4, 6.6; depth of braincase 4.7, —;  $c^1-c^1$  3.0, 3.0;  $m^3-m^3$  4.6, 4.7; length of entire toothrow 5.4, 5.3;  $c-m^3$  4.5, 4.4; length of mandible 8.4, 8.6;  $c-m_3$  4.9, 4.8.

*Pipistrellus cadornae* Thomas, 1916

THAILAND: Petchabun, Thung Salang, Luang, 450 metres. 1 ♂. Thai National Reference Collection.

The first of this species to be reported from Thailand, this specimen is in excellent agreement with the holotype and with those reported from Upper Burma by Hill (1962 : 133). Measurements: length of forearm 33.2, greatest length of skull 13.6; condylobasal length 12.9, condylocanine length 12.6; least interorbital width 3.7, width of braincase 6.7; mastoid width 7.5;  $c^1-c^1$  4.5,  $m^3-m^3$  5.7  $c-m^3$  4.5;  $c-m_3$  4.7.

*Hesperoptenus tickelli* (Blyth, 1851)

THAILAND: Nakhon Rat Sima (= Khorat). 1 ♀.

*Hesperoptenus tickelli* has been recorded hitherto from no further east than Bengal on the Asian mainland and from the Andaman Islands so that its presence in eastern Thailand represents a considerable extension of range. In colour this specimen agrees more closely with Indian examples than with specimens from Ceylon and the Andaman Islands, which are very slightly darker dorsally, especially on the hindback. Measurements: length of forearm 52.3; greatest length of skull 18.5; condylobasal length 18.3; least interorbital width 5.0; zygomatic width 14.1; width of braincase 9.9; mastoid width 11.1;  $c^1-c^1$  6.3;  $m^3-m^3$  9.2;  $c-m^3$  7.4; length of mandible 14.1;  $c-m_3$  8.0.

*Hesperoptenus blanfordi* (Dobson, 1877)

THAILAND: Khao Luang, Nakhon Si Thamrat, 450 feet. 8° 26' N., 99° 58' E. 1 ♂.

This rare species has been recorded once previously from Thailand, by Robinson and Kloss (1915b: 116), who listed a specimen from Khao Nawng, Bandon. Measurements of the specimen from Khao Luang: length of forearm 25.8, greatest length of skull 12.2; condylobasal length 11.6; least interorbital width 4.3; zygomatic width —; width of braincase 7.0; mastoid width 7.2;  $c^1-c^1$  —;  $m^3-m^3$  6.2;  $c-m^3$  3.9; length of mandible 8.4;  $c-m_3$  —.

*Scotophilus kuhlii gairdneri* Kloss, 1917

THAILAND: Koh Klet, Pak Klet, Nonburi, 11 miles north of Bangkok. 1 ♀.

There is some uncertainty in the literature as to the correct classification of Asian *Scotophilus*, but there are, however, several partial studies of the Asian species. Briefly discussed by Sody (1928 : 86), the Asian forms were reviewed in some detail by Tate (1942 : 283) while Shamel (1942 : 325) provided a succinct examination of specimens in the United States National Museum which has remained largely overlooked by subsequent authors. More recently, Siddiqi (1961) reviewed the Indian and some southeast Asian forms, while Peterson (1968) has reviewed the outstanding problems in the genus so far as southeastern Asia is concerned.

The consensus of opinion is that two species should be recognized, a larger and a smaller, sympatric in some places (excluding the very large *Scotomanes* (*Parascotomanes*) *beaulieui* Bourret, 1942 from North Vietnam, listed in *Scotophilus* by

Ellerman and Morrison-Scott, 1951 : 180 but considered synonymous with *Ia io* by Topal, 1970b : 342). Tate, Shamel and Siddiqi assign smaller specimens to *Scotophilus temminckii* Horsfield, 1824; larger specimens are referred to *S. heathi* Horsfield, 1831 by Tate and Siddiqi and to *S. kuhlii* Leach, 1822 by Shamel. Examination of specimens in the British Museum (Natural History) confirms this division into two size groups.

A major difficulty arises in the allocation of names to these groups through the uncertain status of *Scotophilus kuhlii* Leach, 1822, the type species of *Scotophilus*, neither its specific identity nor its locality having been satisfactorily established. The name was considered indeterminate by Sody, Tate (who suggested a further study of the type specimen) and Siddiqi: over the years it has been used both for the smaller and the larger species. However, Peters (1867b : 679) thought the juvenile type specimen to be an example of *S. temminckii* (Horsfield, 1824), a conclusion reiterated by Dobson (1875 : 368) and by Blandford (1888 : 267), who also noted that an examination of the specimen by Thomas showed its upper incisors to be like those of *temminckii*. The type specimen was re-examined recently at the request of Dr R. L. Peterson, of the Royal Ontario Museum, who has published in part (1968 : 1081) the results of this survey. In brief, the holotype consists of a skull and specimen in alcohol, labelled India. It is a very young individual, the third upper molar just piercing the gum, with the two tricuspid milk incisors still present on each side of the jaw. On the right the unicuspid permanent incisor is emergent alongside the inner of these: on the left the permanent tooth has been lost from the damaged socket, only the two milk incisors remaining. Specimens of similar age in the collections of the British Museum (Natural History) are very like this, and the holotype seems at one of the normal stages of dental development in the genus. The dimensions of the teeth indicate that it represents the smaller of the two Asiatic species under consideration. The available evidence suggests that it originated from India: the name *kuhlii* should therefore replace *temminckii* for the smaller species, while *wroughtoni* Thomas, 1897, hitherto considered the Indian subspecies, will become a synonym of *S.k. kuhlii*. Siddiqi (1961 : 452 listed *castaneus* Gray, 1838 from West Bengal, East Pakistan to southwestern China and the Malay Peninsula. This author, however, did not examine *gairdneri* Kloss, 1917 from Thailand. Subspecies allocated to *kuhlii* are listed in full by Tate (1942 : 285) and Shamel (1942 : 327): for the present *gairdneri* is retained for Siamese and Cambodian specimens on account of their slightly darker dorsal coloration when compared with Indian specimens (*kuhlii*): *castaneus* from the Malay Peninsula is dorsally similar to *gairdneri* but is darker ventrally. There is a wide degree of individual colour variation, however, and these differences are small: at best it seems that the subspecies are only weakly separable. Length of forearm (eight specimens) 49.1-51.2 (50.3).

*Scotophilus heathi* (?) *watkinsi* Sanborn, 1952

THAILAND: Bang Phra, Siracha, Chonburi, 13° 12' N., 100° 57' E. 1 ♂.  
Koh Klet Pak Klet, Nonburi, 11 miles north of Bangkok. 1 ♀.  
Bangkok. 1 sex uncertain (skull only).

The collections of the British Museum (Natural History) include extensive series of *S. heathi* from Indian and Burmese localities (listed by Wroughton (1918a : 594) as *S. kuhlii*) but the representation from Thailand and Indochina is very much poorer. As in *S. kuhlii*, there is considerable individual colour variation and for the present no attempt has been made to determine subspecific boundaries.

These specimens are similar in size to those from Pak Nam Pho, Nakon Sawan Province, central Thailand described as *S. solutatus watkinsi* by Sanborn (1952 : 4) to which they are provisionally referred. The description and measurements lead this to be allocated to *S. heathi*, and it may represent a valid subspecies in Thailand.

Measurements (♂, ♀, sex uncertain): length of forearm 61·2, 61·4, —; greatest length of skull 22·6, 22·5, 22·0; condylobasal length 20·8, 20·9, 20·3; palatal length 7·7, 7·8, 7·6; rostral width between anteorbital foramina 8·3, 8·3, 7·9; least interorbital width 5·4, 5·3, 5·3; zygomatic width 16·4, 16·5, 15·9; mastoid width 14·2, 14·4, 13·8; braincase width 10·6, 10·7, 10·2; c<sup>1</sup>-c<sup>1</sup> 7·6, 7·7, 7·4; m<sup>3</sup>-m<sup>3</sup> 10·3, 10·2, 9·8; c-m<sup>3</sup> 7·6, 7·7, 7·5; length of mandible 15·5, 16·0, 15·3; c-m<sub>3</sub> 8·8, 8·9, 8·7.

### *Murina cyclotis cyclotis* Dobson, 1872

THAILAND: Tham Tab Tao, Fang, Chiangmai. 1 ♂ (young adult).

The genus *Murina* was recorded from Thailand by Shamel (1942 : 327) who identified two specimens from the northern part of the country as *M. toxopei* Thomas, 1923 (= *M. florum toxopei*) known otherwise from the island of Buru, in the Moluccas. This specimen from Chiangmai is quite clearly referable to *M. cyclotis cyclotis* as it is described by Hill (1963 : 53), agreeing closely with specimens in the British Museum (Natural History) from northern Burma. It is probable that the specimens described and measured by Shamel also represent *M.c. cyclotis* with which from the account they agree in most respects.

### *Tadarida plicata plicata* (Buchanan, 1800)

THAILAND: Phu Nam Tok Tap Kwang, Kaeng Khoi, Sara Buri, c. 14° 42' N., 100° 52' E. 1 ♂.

CAMBODIA: Angkor Wath, Siem Reap, Cambodia. 1 ♀.

Tonle, 25 kilometres southeast of Phnom Penh, Cambodia. 1 ♂, 5 ♀♀.

Yoshiyuki (1966 : 40) reported *T.p. plicata* for the first time from Cambodia. Length of forearm in the Thai example 47·7; in specimens from Cambodia 46·9-49·0 (48·0).

### SUMMARY

Collections of bats from Thailand and Cambodia examined recently at the British Museum (Natural History) have included a number of species new to these countries or of taxonomic significance. *Megaerops ecaudatus*, *Chironax melanocephalus*, *Myotis annectans*, *Pipistrellus cadornae* and *Hesperoptenus tickelli* are reported for the first time from Thailand, together with *Pteropus hypomelanus* from the islet of Koh Som in the South China Sea. The first specimens of *Taphozous longimanus*

*longimanus*, *Rhinolophus borneensis* and *R. acuminatus* from Cambodia are recorded, with further examples of *Tadarida plicata plicata*, known hitherto in that country from one reported occurrence. Further specimens reported of species poorly known from Thailand include *Rousettus amplexicaudatus*, *R. leschenaulti leschenaulti*, *Sphaerias blanfordi*, *Macroglossus minimus sobrinus*, *Taphozous theobaldi theobaldi*, *Rhinolophus malayanus*, *R. acuminatus*, *Coelops frithii*, *Myotis hasseltii continentis*, *M. siligorensis thaianus*, *Hesperoptenus blanfordi* and *Murina cyclotis cyclotis*. An examination of *Cynopterus angulatus* Miller, 1908 shows it to be a subspecies of *C. sphinx* rather than of *C. brachyotis*. Further specimens of *Rhinolophus coelophyllus shameli* Tate, 1942 indicate that *shameli* is specifically distinct from *R. coelophyllus*. *R. chaseni* Sanborn, 1939 is thought to be a subspecies of *R. borneensis*. Large-footed *Myotis* of southeastern Asia are discussed and *continentis* Shamel, 1942 thought to be a subspecies of *M. hasseltii* rather than of *M. adversus* as it was described. A specimen referable to *Pipistrellus annectans* Dobson, 1871 confirms the view that this taxon should be referred to *Myotis* and that *M. primula* Thomas, 1920 is its synonym. The holotype of *Scotophilus kuhlii* Leach, 1822 has been examined and this name applied to the smallest of the Asiatic species of *Scotophilus*, formerly referred to *S. temminckii* (Horsfield, 1824).

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